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Ecological Survey

Last Chance Meadow Candidate Research Natural Area

Mt. Whitney Ranger District

Inyo National Forest

May 1976

by

J. T. Ball

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Distinguishing Features

The Last Chance Meadow candidate Research Natural Area includes an area of approximately 1769 acres (406 hectares). The parcel spreads over portions of three ridges and includes the entire area of a small basin between the ridges.

The land, which is variable in elevation, slope aspect, topography and in available moisture, is covered for the most part by a concomitantly variable forest. The 1751-acre (388 hectares) forest within the tract is dominated at most points by Pinus balfouriana Grev. & Balf. Other important tree species are Pinus contorta Douglas var. murrayana Grev. & Balf. and Pinus flexilis James.

In the southwestern portion of the Research Natural Area a small stream provides the center for 17.5 acres (4 hectares) of gently sloping meadows.

A portion of the eastern side of the Natural Area extends down the precipitous Sierran escarpment. This provides a markedly different physical and biological environment from the steep yet well forested area to the west where the slopes are predominately north- or south-facing.

Location

The Last Chance Meadow candidate Research Natural Area occupies approximately 1769 acres (406 hectares) immediately south of Last Chance and Horseshoe Meadows on the south side of the Cottonwood Basin. The land is within Sections 13, 14, 23 and 24 of Township 17 South Range 35E Mount Diablo Meridian (see App. 1).

Access to the area is very good as it is some 18 miles from Lone Pine via the Horseshoe Meadow Road. The Research Area is .5 miles south of this road's terminus. Access to the central and southern portions of the natural area may be obtained by climbing the steep north-facing slope above Horseshoe Meadow or via the trail over Mulkey Pass.

All the land in the Natural Area is federally owned and is administered by the Mt. Whitney Ranger District, Inyo National Forest.

Boundaries

Beginning at the point at which the 10,000-foot contour line in the northwest corner of Section 23, Township 17S Range 35E MDM intersects the western boundary of Section 23, the proposed boundary proceeds northeast through Section 14 along the 10,000-foot contour (see App. 2). At the point where the contour line intersects an east-west bisector of Section 14 the boundary turns east running .25 miles. From here the boundary turns north running .25 miles and then turns east once more, running 1.25 miles to the eastern edge of Section 13 T 17 S R 35 E. The boundary then runs south to the east-west bisector of Section 24. From this point on the east side of Section 24 the boundary runs west along the bisector to Section 23. The boundary then runs south for .25 miles to a point .75 miles south of the line separating Sections 14 and 23. From this point the boundary runs west to the point where the line separating Sections 22 and 23 crosses the ridge just east of Mulkey Pass. From here, (.75 miles south of the line separating Sections 23 and 14) the boundary runs north to the point where this line intersects the 10,000-foot contour.

Physical Environment

The Last Chance Meadow Natural Area has significant facets of its surface exposed to all azimuth angles. The majority of the terrain is exposed in either north or south directions along two east-west running ridges. The topography is quite variable with slope angles of approximately 25 degrees being common for north-facing areas while south-facing slopes in general lie at angles near 15 degrees. The slope angle may be 75 degrees or greater along the escarpment on the east side of the Natural Area.

The rock underlying this region is entirely granitic and of Mesozoic origin. The soil consists of decomposed granite with little evidence of organic matter accumulation. The surface of many of the slopes is covered with scree. The meadow which runs through the southwestern portion of the tract is on a shallow layer of alluvium which contains a sizeable accumulation of organic matter.

Little information is available concerning the climate of this specific area. However, there is ample evidence of the effects of differing micro- and mesoclimatic regimes on the vegetation throughout the Natural Area.

Flora

A check list of vascular plants from the Last Chance Meadow Area was compiled by Mrs. Mary DeDecker from collections which she made in the area August 7 and 8, 1974. This list constitutes appendix 3. Plants on the California Native Plant Society's "List of Rare and Endangered Plants" are indicated on this list.

A check list of plants of the Cirque Peak area (4 miles west of the Last Chance Meadow area) compiled by J. T. Howell[1/] suggests additional species which might also occur in the Natural Area. These are:

Calamagrostis purpurascens R. Br. in Richards

Festuca brachyphylla Schult.

Koeleria macratha (Ledeb) Spreng.

Poa rupicola Nash ex. Rydb.

Androsace septentrionalis L. ssp. subumbellata (A. Nels.) Robbins

Castilleja nana Eastw.

According to Howell, 18% of the alpine plants which he collected in the Cirque Peak region have their southern limit in this area. The cause of this decline in species appears to be a decrease in the elevation of the contiguous Sierran Crest south of this area.

It is likely that numerous other species will be found on the escarpment at the eastern edge of the Natural Area. Access to the escarpment is difficult and as a result it has not been well botanized. It is also likely that other species will be added to the check list if collections are made throughout the growing season.

The presence of Sarcodes sanguinea in the Natural Area is an occurrence worth noting. The distribution of this unusual plant is not well understood.

1/ Howell, J. T. 1951. The Arctic-Alpine Flora of Three Peaks in the Sierra Nevada. Leaflets of Western Botany vol. 6 pp. 141-154.

Its occurrence here is without question near the south and east limit of its Sierran distribution. It is interesting that this plant, classically described as growing in thick humus, is found in this area where there is little or no humus.

Vegetation

Photograph No. 1 taken from near the east side of the Natural Area looking toward the west yields a general impression of the vegetation.

A map showing the major physiognomic and vegetation groupings which occur within the Last Chance Meadow Natural Area appears in Appendix 4. It should be emphasized that the lines delineating, in fact, the classifications of the four forest groupings (P. contorta - P. balfouriana, P. balfouriana - P. contorta, P. balfouriana - P. flexilis, P. balfouriana) are artificial. No clear separation of these groups is possible in the field. The designation of these groups is intended only to illustrate the tendency of the vegetational response.

Pinus contorta var. murrayana is of increasing importance at lower elevations and along water courses within this region. There is in general, a decrease in the absolute basal area of Pinus balfouriana which correlates with the increase in basal area of Pinus contorta.

There are tendencies for increased basal area of Pinus flexilis with increased altitude and along the northeastern exposure of the ridge rising to the south of Last Chance Meadow. There is a reduction in total basal area of all species with increasing altitude and exposure on this ridge.

Just south of the crest of the ridge above Last Chance Meadow there is a dramatic increase in the basal area of the foxtail pine (see Photograph No. 2).

Appendix 5 is illustrative of the variation in basal area which is encountered throughout the forested areas. Appendix 6 shows the locations of the representative sites from which the data in Appendix 5 was obtained.

The slopes of the escarpment in Section 13 have been represented on the vegetation map as "bare." In reality these slopes support widely scattered shrubs and foxtail pines. Photograph No. 3 shows a portion of the escarpment.

There are several areas in the center of Section 13 which are essentially lacking in vegetation. There is no immediately apparent reason for the absence of vegetation in these areas on flat to moderately south-facing slopes. All of these areas are surrounded by well vegetated areas.

Of special interest is the structure of the vegetation on the plateau in the southeast corner of Section 13. The plateau appears as the cross-hatched area in Appendix 5. Photograph No. 4 is a view of it from the south, and Photograph No. 5 is a more distant view from the north. This plateau, covered by a jumble of large boulders, supports a virtually pure stand of foxtail pines, most of which are large gnarled trees. Many of these trees exceed 30 inches DBH as do most of the dead snags, which are abundant. This is a remarkable sight (see Photograph No. 6). Examination of this site reveals that all age classes are well represented, despite the initial visual impression that this tableland is covered only by weather-beaten patriarchs.

It is suggested that the existence of so many old trees on this high plateau may be due to protection from fire. The steep topography and the presence of only scattered vegetation surrounding the plateau appears to reduce or exclude the spread of fire into the stand. The exposed position of the plateau makes it a likely target for lightning strikes. However, the many large boulders and wide spacing of the trees may reduce the spread of fire within the stand.

The role of fire in the dynamics of subalpine forests is in need of study. Fire is clearly a factor in shaping the foxtail pine community. The majority of the trees within the Research Area show evidence of fire scarring. The scarring appears to be of various ages, confined largely to upper reaches of the trees, and does not occur in any immediately conspicuous pattern among trees. This is suggestive of many small lightning fires.

All three species of pine appear to be reproducing well in the Research Area (Photograph No. 7). All types of microsites appear to have at least some trees in all age classes (except the previously discussed bare areas).

The subarboreal vegetation in Pinus balfouriana forests is of as much scientific interest as the tree stratum. In fact, some of the most common remarks that may be heard about foxtail pine stands concern the lack of litter and vegetation on the forest floor.

At most points within the Last Chance Meadow Natural Area it is possible to run 40 by 1 meter transects in any direction and contact fewer than 10 plants. Many such transects will not possess a single plant. Litter

consisting of old cones and small quantities of needles appears to accumulate almost exclusively where gravity and topography interact, stopping the transport of litter down slopes which constitute wide catchment areas. Flat places rarely show any litter build up. The causes of this paucity of litter are unknown and are in need of study.

In the region of the Last Chance Meadow Natural Area a significant amount of ground is covered only by Selaginella and caespitose species of Eriogonum. (the Selaginella, which occurs mainly on steep north-facing slopes, appears to be coupled with the protrusion of rocks through the scree which constitutes the surface.)

Tree Growth Characteristics

Fifty-nine increment cores were taken from twelve Pinus balfouriana and ten P. contorta. Cores were collected from breast height on P. contorta and breast height and other heights on P. balfouriana. Most of the cored trees were situated on the north or south slopes of the ridge rising south of Horseshoe Meadow or from the slopes of the ridge east of Mulkey Pass. These cores were analyzed for common tree ring parameters such as mean ring width, age, standard deviation and mean sensitivity, first order serial correlation, etc. The resulting data were studied to obtain an indication of the height and diametric growth characteristics and possible limitations to the growth of these trees.

The average breast height for mature trees runs between 25 and 33 inches. Trees of this size were almost always found to have rotten centers. The indication from rotten and non-rotten trees is that these

mature trees are in general older than 600 years and in some cases probably well over that figure. Cores from Pinus balfouriana between Mulkey Pass and Trail Pass have been estimated to be within the 1000-1500 year age class by workers at the Laboratory of Tree-Ring Research in Tucson.

Large trees are in general gnarled, showing decadence of the crown and fire-scarring. Most foxtail pines in the Natural Area have DBH's between 18 and 22 inches. These trees have apparent ages of between 150 and 300 years. These trees also tend to have non-vital areas in their crowns, and evidence of fire-scarring.

The average height of Pinus balfouriana on this site is close to 12 meters. This height is rarely exceeded even by older trees, including those with little decadence in their crowns and DBH's of approximately 25 inches. Trees in this area appear to attain heights of about 10 meters by the age of 100 years. The cause of the drastic reduction in height growth after that period is not understood.

Comparison of the pattern of diameter growth between different microsites within the central portion of the Last Chance Meadow Natural Area exhibits no clear pattern of variability. Both the standard deviations and mean sensitivities of the tree ring indices for Pinus balfouriana and P. contorta are moderate when compared to those of other western arid zone conifers. This would indicate that the Last Chance Meadow area is a favorable locale for the growth of both species. The first order auto-correlation for the foxtail pine in this area is fairly

low compared to other arid zone conifers. This suggests that each growth ring may be a fairly good integrator of the growth factors for the particular growing season in which it was formed, showing relatively little lag effect from the previous year.

Justification

The subalpine forests have been the object of few ecological studies. Much scientific work remains to be done on all phases of the Sierran subalpine zone, particularly of the often ignored southern portion of the range.

The Pinus balfouriana forests are particularly interesting and important in the southern Sierra, but have not been the subject of many studies in the literature. Some of the specific questions which should be examined and answered in relation to the foxtail pine include:
(1) What is the extent of its distribution in the southern Sierra (this is not accurately known)? (2) What factors limit the growth in favorable sites? (3) What factors limit the distribution of the forest type? (4) What is the role of fire in natural and managed subalpine forests? (5) What is the cause of the remarkable lack of litter beneath foxtail pine forests? (6) How does this forest type vary in structure and productivity over environmental gradients? (7) How do the factors affecting these trees in the southern Sierra relate to factors affecting growth and productivity in the northwestern California Pinus balfouriana forests?

The Last Chance Meadow Research Natural Area provides an excellent representative locale for examination of these questions as well as queries

pertaining to other attributes of the subalpine environment. Evidence gathered from tree-ring data suggests that the Last Chance Meadow area is in general a favorable location for the growth of both Pinus balfouriana and P. contorta var. murrayana.

The representative nature, the diversity of the environment and the correlated change in forest structure with regard to elevation, slope aspect and exposure, topography, available moisture, etc., makes this site one of great promise for ecological research.

The presence of at least three plants of restricted distribution is an added value of the area. The gentianaceous Frasera tubulosa Coville appears to be growing well within this particular site. The well-known but uncommon and poorly understood snowplant, Sarcodes sanguinea Torrey, seems here to be growing in conditions which are atypical of its usual sites.

The arrangement of the small stream and meadow system provides an excellent opportunity for study within the Research Natural Area. The entire watershed for this stream is within the designated tract and the topography is such that the system lends itself to effective research.

A major contribution to the usefulness of the Last Chance Meadow Research Area is its accessibility. The penetration of the Horseshoe Meadow road to the subalpine level near the crest of the Sierra results in one of the few--if not the only--places where one may drive a normal vehicle close to a forest of Pinus balfouriana. This can greatly aid

in the transportation of bulky and heavy materials which are needed in studying an area of this kind. Such accessibility greatly enhances the attractiveness of this site to workers in a wide variety of fields.

Impact on Other Resources

Timber

The feasibility of a timber operation in this forest type over this type of topography is limited. The heavy recreational use of surrounding areas also makes the harvesting of timber in this area highly unlikely.

Grazing

The forage value of the forested area is insignificant at best. There has been grazing in the meadow area. This area constitutes only 15 acres (6 hectares) and its withdrawal from grazing should not have a significant impact on the overall grazing resources of the area.

Minerals and water

No mineral deposits are known to occur within the Research Natural Area. There will be no effect on the water resources of the area.

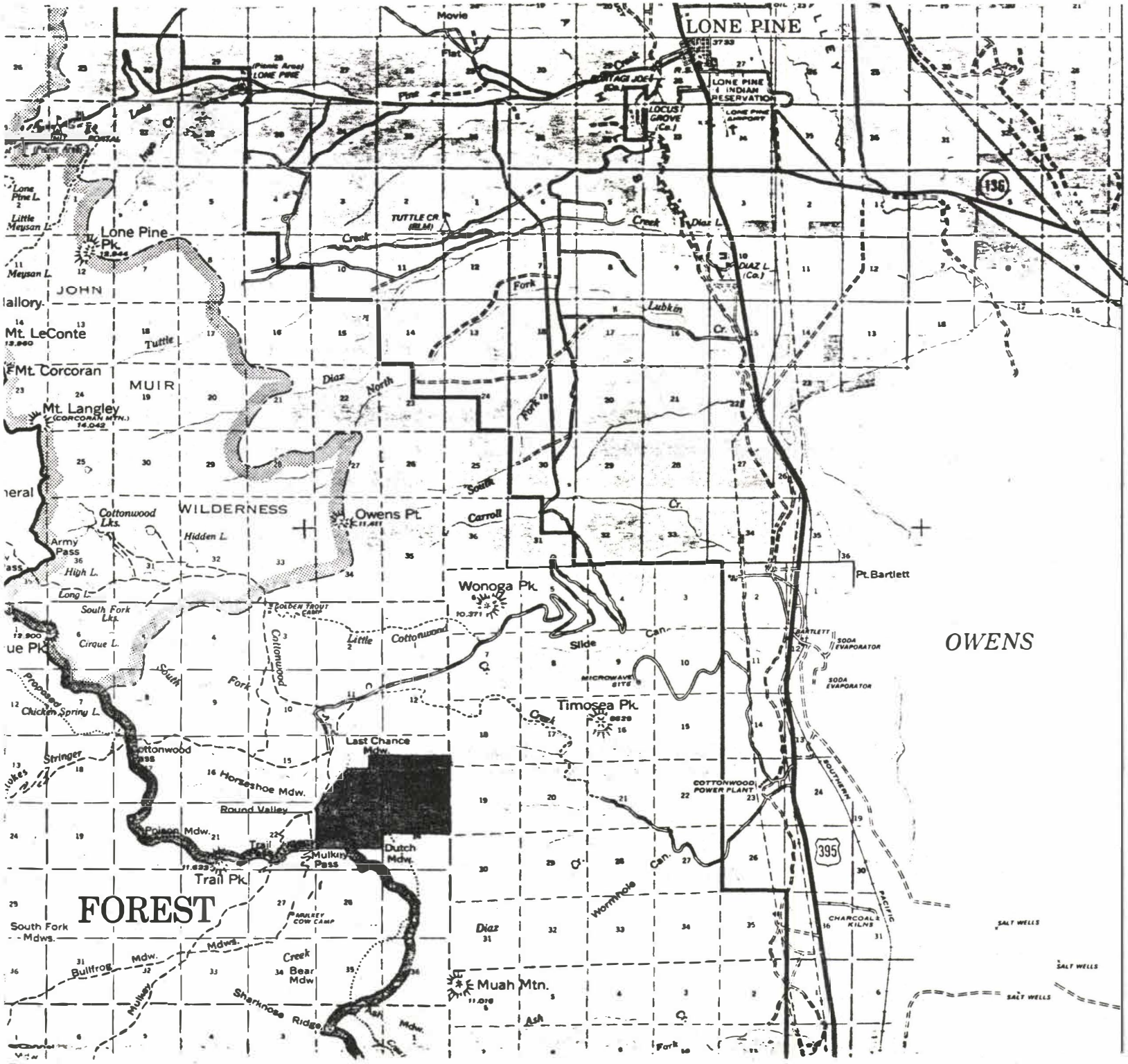
Recreation

The Pacific Crest Trail is planned to pass just south of the Natural Area as it goes from Dutch Meadow to Mulkey Pass and thence to Trail Pass (see Appendix 2). This is not expected to conflict with the Research Natural Area as use of the Pacific Crest route is anticipated to be confined largely to the immediate vicinity of the trail.

A new trail is presently evolving which diverges approximately one-third of the way up the northside of Mulkey Pass, proceeds over a small rise and into the meadow in the southwest quadrant of the Research Area.

The trail continues down through the meadow area to Dutch Meadow. The trail is at present poorly defined where it crosses the meadow. There is a need to (a) either prohibit use of this cut off or (b) to define a minimal trail through the Research Area. As this new trail eliminates 200 feet of the climb over Mulkey Pass for parties going to Dutch Meadow, the trail will probably continue to be used. Therefore the second alternative seems the wiser choice.

The unrestricted passage of recreationalists through the Research Area is, however, preferable to the construction of a large trail through the area.

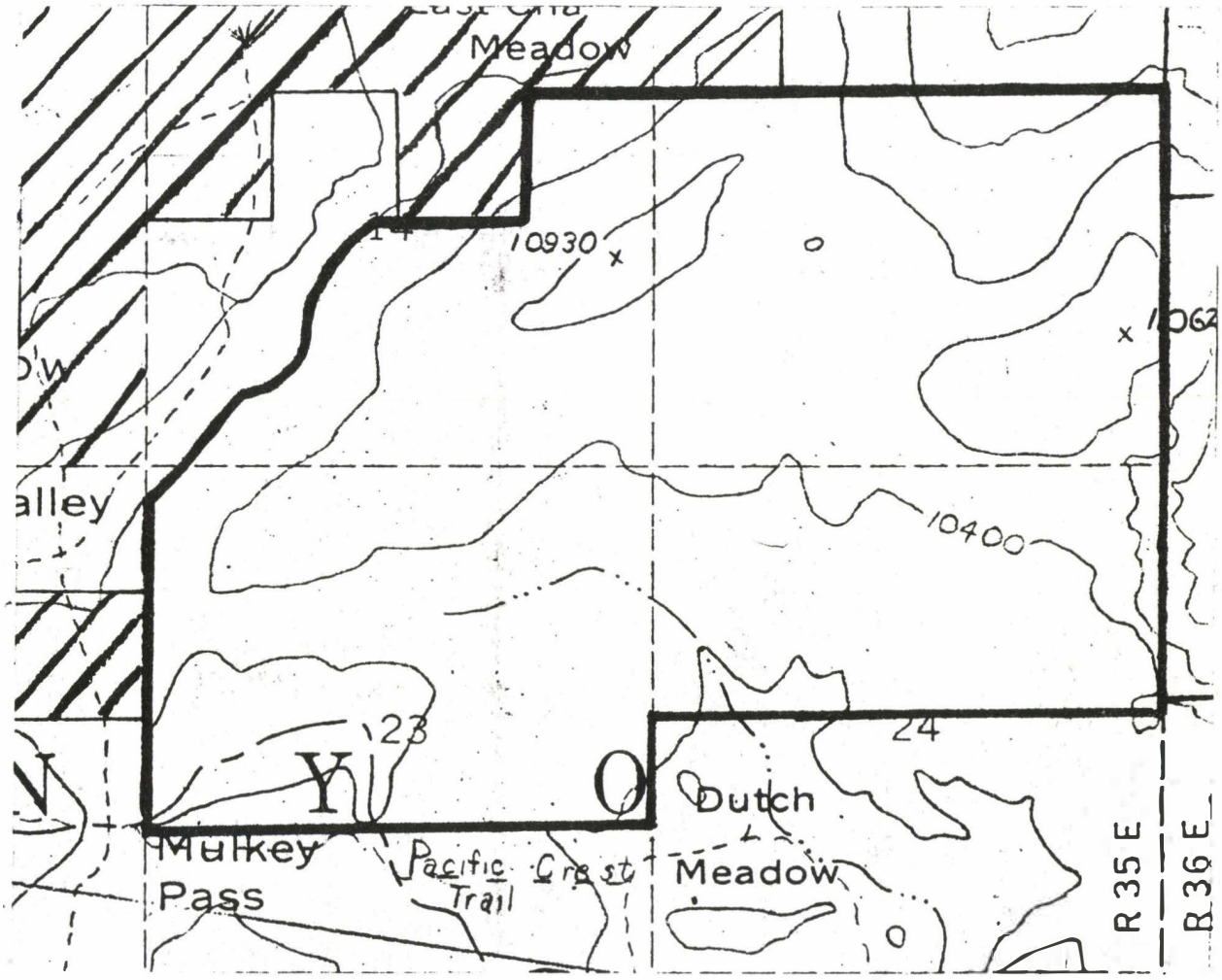


LOCATION OF THE LAST CHANCE MEADOW

RESEARCH NATURAL AREA

Appendix 1

Appendix 2



BOUNDARIES OF THE LAST CHANCE MEADOW

RESEARCH NATURAL AREA

Scale 1:23328 Contour Interval 400 feet

Hatched area is non-Forest Service lands

APPENDIX 3

PRELIMINARY CHECK LIST OF VASCULAR PLANTS

of

LAST CHANCE MEADOW CANDIDATE RESEARCH NATURAL AREA

Inyo National Forest

Mt. Whitney Ranger District

by

Mary DeDecker

Independence, California

January 6, 1975

*** Denotes plants which appear on the California Native Plant Society's November 1974, List of Rare and Endangered Plants.

Division. TRACHEOPHYTA

Subdivision. LYCOPSIDA

Class. LYCOPODIAE

Order. SELAGINELLALES

SELAGINELLACEAE

Selaginella watsonii Underwood — On a steep north slope.

Subdivision. PTEROPSIDA

Class. FILICAE

Order. FILICALES

ASPIDIACEAE

Cystopteris fragilis (L.) Bernhardi

Class. CONIFERAE

Order. CONIFERALES

PINACEAE

Pinus balfouriana Greville & Balfour — Predominant tree.

Pinus contorta Douglas var. murrayana Greville & Balfour

Pinus flexilis James — Summit of ridge.

Class. ANGIOSPERMAE

Subclass. DICOTYLEDONES

APIACEAE

Oreonana clementis (Jones) Jepson

Perideridia parishii (Coulter and Rose) Nelson & MacBride ssp. latifolia (Gray) Chung & Constance

Sphenosciadium capitellatum Gray — Meadow.

ASTERACEAE

Antennaria rosea Greene

Arnica mollis Hooker — Meadow.

Artemisia rothrockii Gray — Bordering meadow.

Aster adcendens Lindley ex Hooker — Meadow.

Chrysothamnus viscidiflorus (Hooker) Nuttall ssp. viscidiflorus
[C. V. ssp. pumilus (Nuttall) Hall & Clements]

Erigeron clokeyi Cronquist

Haplopappus macronema Gray

Helenium hoopesii Gray — Meadows & seepage areas.

Hieracium horridum Fries

Orochaenactis thysanocarpha (Gray) Coville

Senecio canus Hooker

Senecio scorzonella Greene — Meadow.

Tanacetum canum D. C. Eaton

Tetradymia canescens Decandolle

BORAGINACEAE

Cryptantha circumscissa (Hooker & Arnott) Johnston
ssp. rosulata (J. T. Howell) Mathew & Raven

Cryptantha glomeriflora Greene — Meadow border.

Cryptantha nubigena (Greene) Payson

BRASSICACEAE

Arabis inyoensis Rollins

Arabis platysperma Gray

Draba stenoloba Ledebour var. nana (O. E. Schultz) C. L. Hitchcock

Erysimum argillosum (Greene) Rydberg

CARYOPHYLLACEAE

Arenaria congesta Nuttall var. suffrutescens (Gray) Robinson

Arenaria nattallii Pax ssp. gracilis (Gray) Maguire

Sagina saginoides (L.) Karsten var. hesperia Fernald — Meadow.

Stellaria longipes Goldie — Wet meadow.

ERICACEAE

Sarcodes sanguinea Torrey — Rare here.

FABACEAE

Lupinus breweri Gray var. bryoides C. P. Smith ex Jepson

Trifolium monanthum Gray — Meadow.

GENTIANACEAE

*** Frasera tubulosa Coville

Gentiana newberryi Gray — Meadow.

LAMIACEAE

Monardella odoratissima Bentham ssp. parvifolia (Greene) Epling

ONAGRACEAE

Epilobium angustifolium Linnaeus ssp. angustifolium — Meadow.

Gayophytum diffusum Torrey & Gray ssp. parviflorum Lewis & Szweykowski

POLEMONIACEAE

Leptodactylon pungens (Torrey) Rydberg ssp. hallii (Parish) Mason

POLYGONACEAE

Eriogonum lobbii Torrey & Gray

Eriogonum ovalifolium Nuttall var. nivale (Canby) Jones

Eriogonum spergulinum Gray var. pratense (S. Stokes) J. T. Howell — Dwarf form.

Eriogonum umbellatum Torrey var. covillei (Small) Munz & Reveal

Eriogonum wrightii Torrey var. subscaposum Watson

	Polygonum douglasii Greene var. douglasii	Meadow border.
	Polygonum kelloggii Greene	Meadow.
	Rumex paucifolius Nuttall ex Watson	Meadow.
PORTULACACEAE		
	Calyptridium umbellatum (Torrey) Greene var. caudiciferum (Gray) Jepson	
	Claytonia chamissoi (Ledebour) R. J. Davis	Meadow.
PRIMULACEAE		
	Dodecatheon alpinum (Gray) Greene	Wet meadow.
	Dodecatheon alpinum (Gray) Greene ssp. majus H. J. Thompson	Wet meadow.
RANUNCULACEAE		
	Ranunculus alismaefolius Geyer var. alismellus Gray	Meadow.
ROSACEAE		
	Holodiscus microphyllus Rydberg	
***	Ivesia campestris (Jones) Rydberg	Meadow.
	Ivesia santolinoides Gray	
	Potentilla glandulosa Lindley ssp. nevadensis (Watson) Keck	Meadow.
	Potentilla gracilis Douglas ex Hooker ssp. nuttallii (Lehmann) Keck	Wet meadow.
SALICACEAE		
	Salix lemmonii Bebb	Along stream.
	Salix rigida Muhlenberg	Springs above meadow.
SAXIFRAGACEAE		
	Jamesia americana Torrey & Gray var. californica (Small) Jepson	
	Ribes cereum Douglas	

SCROPHULARIACEAE

Castilleja breweri Fernald	
Keckiella rothrockii (Gray) Straw	Only one plant found.
Mimulus breweri (Greene) Coville	
Mimulus coccineus Congdon	
Mimulus guttatus Fischer ex Decandolle	Wet meadow.
Mimulus leptaleus Gray	
Mimulus primuloides Bentham var. pilosellus (Greene) Smiley	Wet meadow.
Pedicularis attollens Gray	Wet meadow.
Penstemon heterodoxus Gray	
Penstemon newberryi Gray	

Subclass. MONOCOTYLEDONES

CYPERACEAE

Carex microptera Mackenzie	Meadow.
Carex spectabilis Dewey	Meadow.
Carex subnigricans Stacey	Meadow.

JUNCACEAE

Juncus mertensianus Bongard	Meadow.
Luzula comosa E. Meyer	Meadow.

LILIACEAE

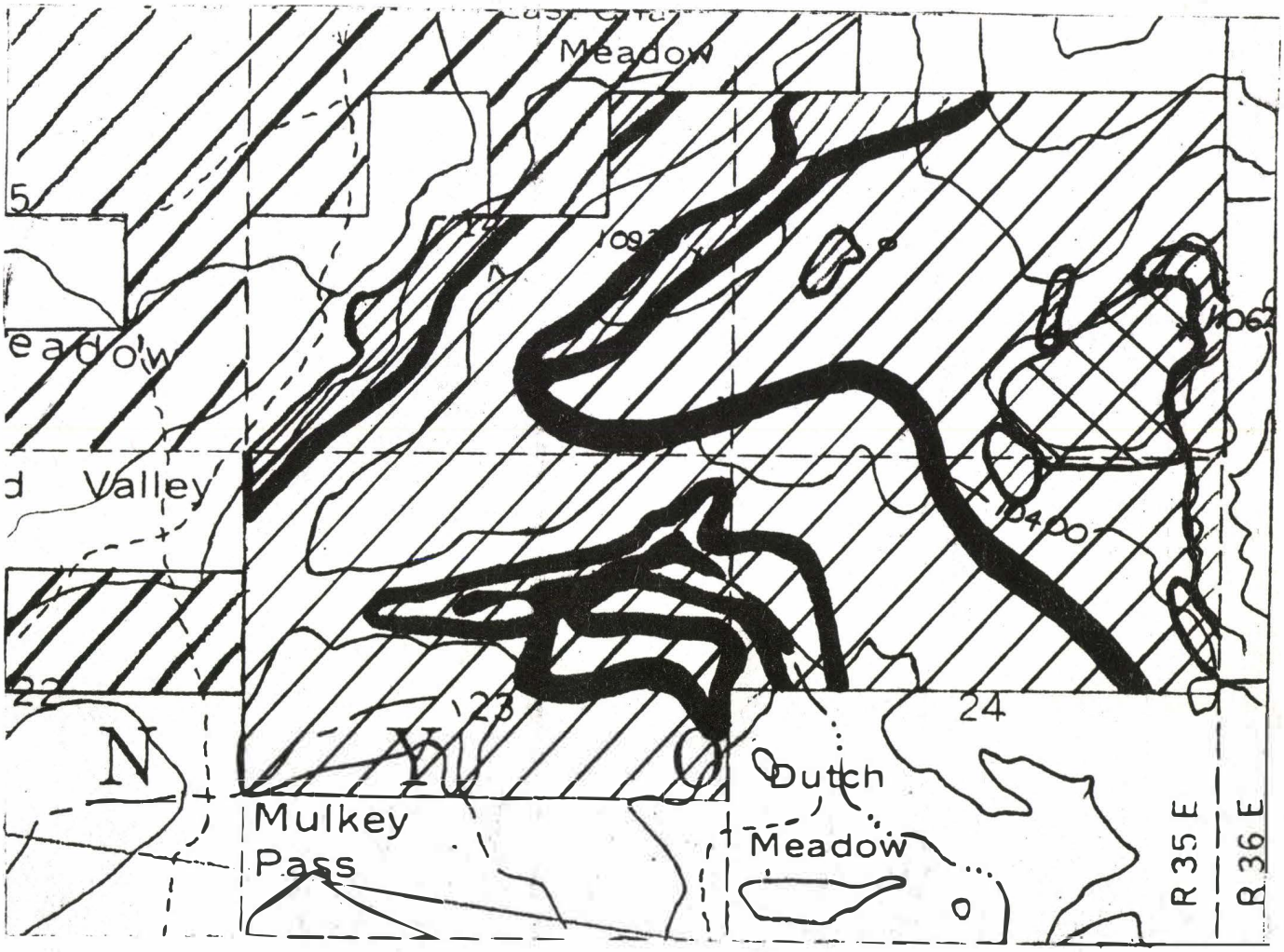
Veratrum californicum Durand	Meadow.

POACEAE

Agrostis lepida Hitchcock	Meadow.
Melica stricta Bolander	
Muhlenbergia richardsonis (Trinius) Rydberg	

Phleum alpinum Linnaeus	Meadow.
Poa hanseni Scribner	Meadow border.
Sitanion jubatum J. G. Smith	
Stipa occidentalis Thurber	
Tricetum spicatum (L.) Richter	

Appendix 4



VEGETATION OF THE LAST CHANCE MEADOW

RESEARCH NATURAL AREA

Variable mixture of P. balfouriana and P. contorta. P.balfouriana dominant.

Areas of nearly pure stands of P.balfouriana .

Variable mixture of P.contorta and P.balifouriana. P.contorta dominant.

Mixture of P.balfouriana and P.flexilis either species may be dominant.

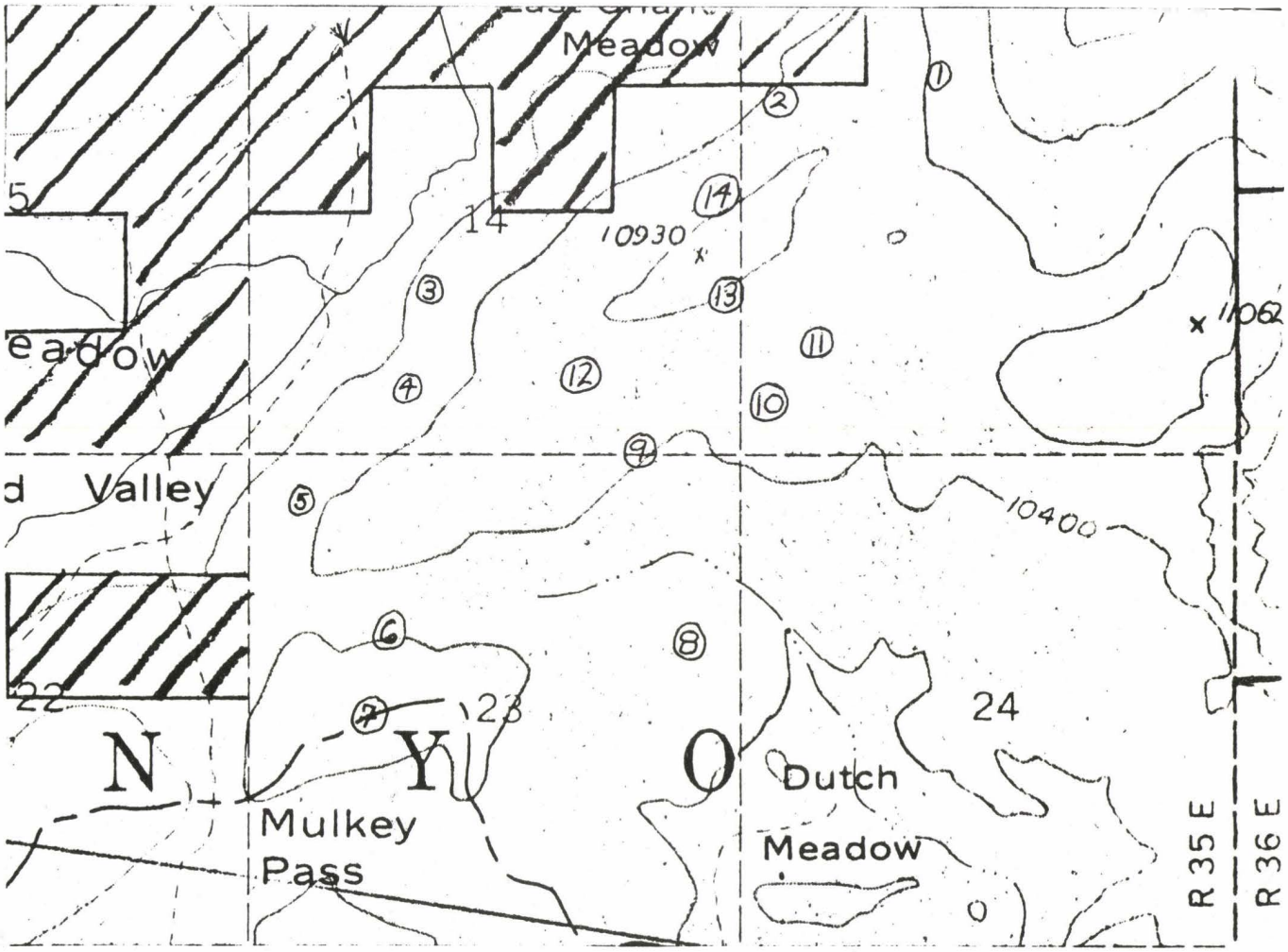
Dry areas without woody vegetation

Meadows

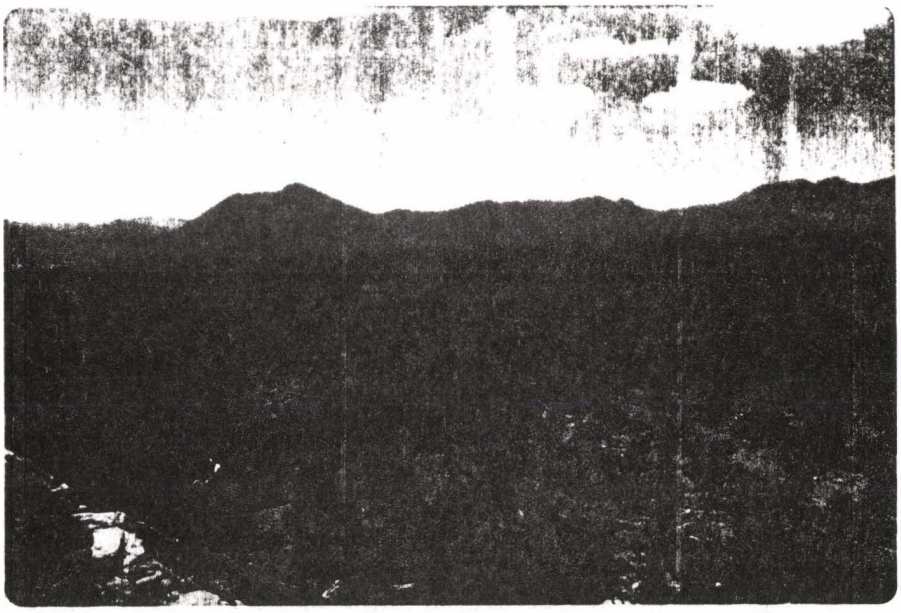
APPENDIX 5

Site No.	Pinus balfouriana			Pinus contorta			Pinus flexilis			Total basal area	
	Sq.ft./ ac.	Sq.m/ ha.	% of basal area	Sq.ft./ ac.	Sq.m/ ha.	% of basal area	Sq.ft./ ac.	Sq.m/ ha.	% of basal area	Sq.ft./ ac.	Sq.m/ ha.
1	231	53	100	--	--	--	--	--	--	231	53
2	5	1	9.5	5	1	9.5	43	10	81	53	11
3	65	15	34	123.5	28.5	65	2.5	.5	1	191	44
4	170	39	75	50.5	11.5	22	5.5	1.0	3	226	51.5
5	218	50	79	57	13	21	--	--	--	275	63
6	188	43	92	17	4	8	--	--	--	205	47
7	130	30	91	9	2	6	4	1	3	143	33
8	244	56	98	4	1	2	--	--	--	248	55
9	188	43	96	9	2	4	--	--	--	196	45
10	50	11.5	40	73.5	17	60	--	--	--	123.5	28.5
11	210	48	93	15.5	3.5	7	--	--	--	225	51.5
12	236	54	99.5	1	.25	.5	--	--	--	237	54.25
13	180	41	99	2	.5	1	--	--	--	182	41.5
14	96.5	22	76	--	--	--	34.5	8	24	131	30

Appendix 6



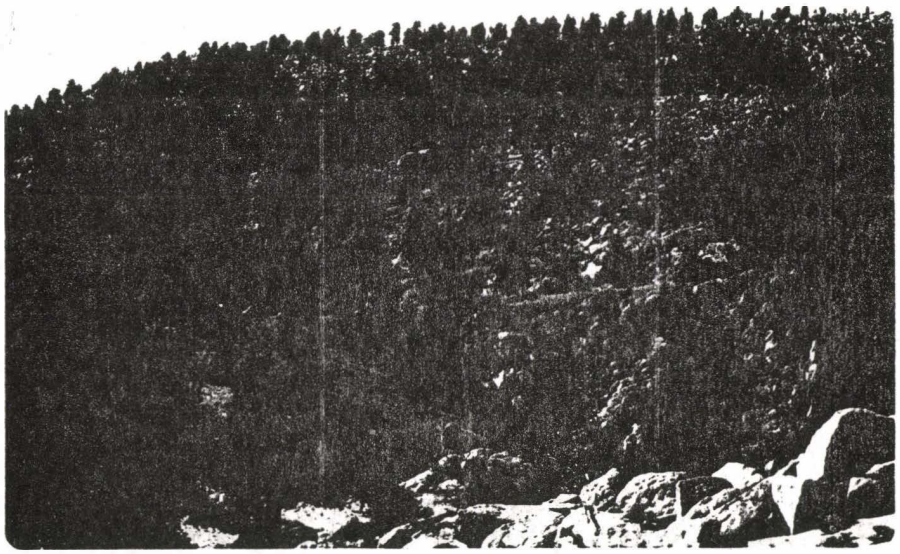
Sampling sites for data in appendix 5



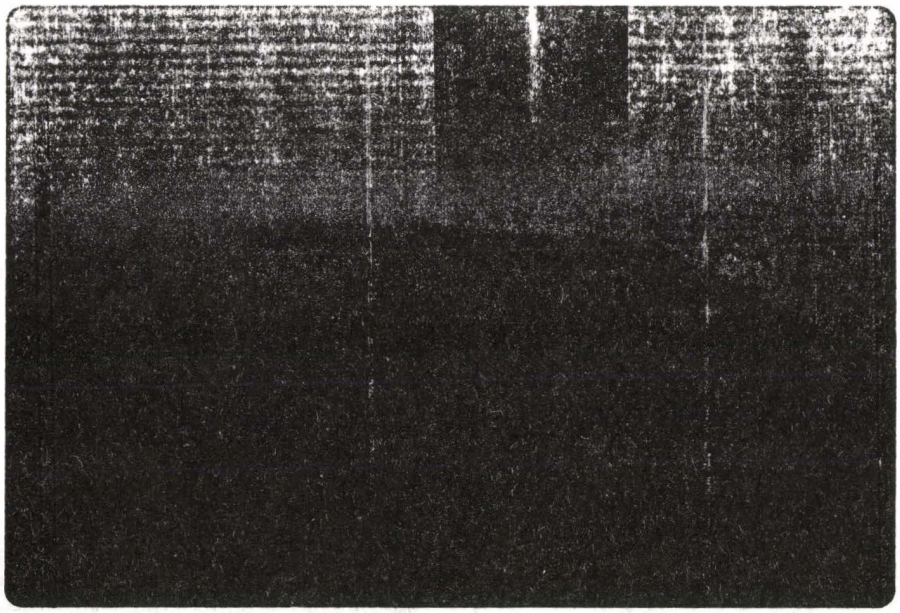
1. View from near the eastern boundary looking west across the Natural Area. This yields a good impression of the vegetation's aspect. The upper reaches of the small meadow may be seen on the right side of the picture. The ridges on either side of the meadow and land between the meadow and the point of observation are within the Natural Area.

2. View eastward along the ridge above Last Chance Meadow. The trees in the foreground are immediately south of the ridge crest. The mid-ground of the photograph illustrates the contrast between the sparsely vegetated north side and the heavily forested south side of the crest.

3. View looking north at a portion of the escarpment along the Natural Areas's eastern boundary.

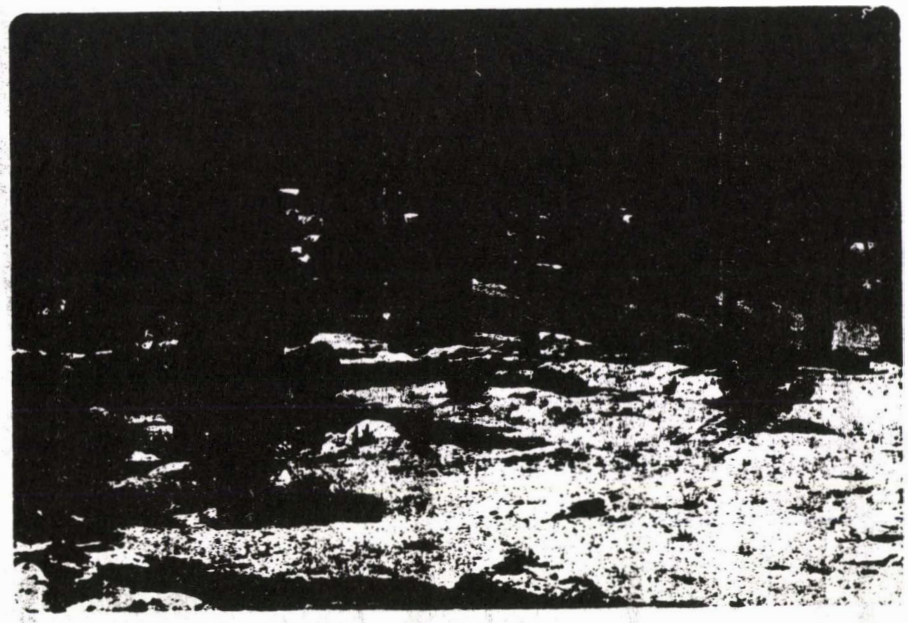


4. View looking north toward the high plateau along the east side of the Natural Area.



5. View of the plateau from the northwest. The region tree line on the left side of the plateau has an elevation of 11,062 feet. The haze is due to a large fire in the Monanche area some 20 miles south east of the Natural Area.

6. View of the forest on the plateau at the east side of the Natural Area. These are actually some of the smaller trees on the tableland.



7. Various-sized young trees bear testimony to good reproduction of Pinus balfouriana in the Research Natural Area. Notice the paucity of both herbaceous vegetation and litter.